shone 61 per cent of the possible, an average of 7.7 hours per day.

The following is an abstract of Mr. Stockman's report for the month of May:

No general storms known to have occurred. Certain weak barometric depressions, with slightly increased wind and rain occurred on the 1st, 2d, 3d, and rather high winds occurred at Havana on the 1st, 6th, 7th, 15th, 16th, 17th, 24th, 25th, 29th, 30th, and 31st. None of these winds could be considered as anything but the regular northeast trades, except the squalls of the 1st, 24th, and 25th; the last attended a thunderstorm and heavy rain. No damage was done by the wind.

Hail was reported at Santa Clara on the 26th. On the 21st a whirlwind occurred 12 miles from Pinar del Rio and passed from east to west, doing no damage.

The following comparisons are made between a ten years' (1888 to 1897) mean and May, 1899:

	Temperature.		Rainfall.	
	10-year mean.	1899.	10-year mean.	1899.
Mean monthly	78.8	76.8		
Absolute maximum in 1890	97.9	88.7		
Absolute minimum in 1889	64.4	66.1		
4 a. m.	72.7	71.4		
6 a. m.	72.9	70.5		
8 a. m.	76.8	75.7		
10 a. m.	82.8	82.0		
12 noon	83.1	82.8		
2 p. m.	83.3	81.8		
4 p. m.	82.8	80.6		
6 p. m.	80.4	79.5		
8 p. m.	77.5	77.9		
10 p. m.	76.3	76.2		
Mean monthly			5.15	1.64
Greatest amount in twenty-four hours			6.27	1.35
Average number of rainy days			9.9	4
Greatest number of days with rain			16	
Least number of days with rain			3	

This table shows that the mean temperature for May was 2° lower than the ten years' normal, the maximum 9.2° lower than the absolute maximum; minimum 1.7° higher than the absolute minimum, and the mean temperature at the selected hours from 0.1° to 3.1° lower than the normal.

The rainfall for the month was greatly deficient, being —3.51 inches from the ten years' normal and —2.83 inches from a thirty years' period. The number of days on which rain fell was but one more than the least recorded in a ten years' period. The average monthly rainfall for a thirty years' period is 4.47 inches, and average number of days with rain 9.3 inches, both of these averages being less than the average for a ten years' period.

Wind.

	Mean hourly velocity.	Annual hourly velocity.										Prevailing direction.
		4 a. m.	6 a. m.	8 a. m.	10 a. m.	12 noon.	2 p. m.	4 p. m.	6 p. m.	8 p. m.	10 p. m.	
Annual	7.8*	4.3	4.5	6.5	9.2	10.7	11.4	10.7	8.7	6.9	5.6	e.*
May, 1899	11.0	4.9	4.8	6.2	10.9	16.0	18.8	18.7	17.1	13.3	9.8	ne.

* 10-year mean for May.

From the above, it will be seen that the hourly averages for May, 1899, differ from the annual hourly by from —0.3 at 8 a. m. to +8.0 at 4 p. m. With the exception of 8 a. m., all averages are higher, and the high average velocities continued much later in the day. The total number of miles for the month was 8,219.

THE UTILIZATION OF FOG.

By FORD A. CARPENTER, Observer Weather Bureau, San Diego, Cal.

A cursory examination of our local meteorological conditions is given in a paper in the MONTHLY WEATHER REVIEW for March, 1899, pages 101–102, by Mr. A. McL. Hawks, C. E., Tacoma, Wash., on "The Utilization of Fog." Mr. Hawks says:

I spent March to May, 1898, in San Diego. The country was absolutely arid; no rain of import had fallen in eighteen months, the streams were dry, the huge reservoirs were almost empty, ranches were barren, wheat fields burnt up, cattle driven out of the State, fruit trees dying for lack of water. And yet almost every evening (I think safely three out of five) tons upon tons of water rolled in from the ocean over the land, hung there all night long, only to evaporate in the a. m. with the parched land almost as thirsty as before its visit. The diurnal cycle usually reads thus: at about 10 a. m. a sea breeze springs up, blowing 12 to 20 miles per hour from the west, with the sun shining as it only can shine in the arid countries; at 5 p. m. the breeze falls until by 6 p. m., it is usually gone so entirely that the sailors method of licking a finger to detect the direction of the wind fails to find any stirring. As the breeze dies down a bank of fog forms out over the ocean and rolls shoreward. This is usually about 500 feet deep. And when it strikes Point Loma dashes up into the air like spray from a rock. Long after the wind dies out the fog continues to roll inland until it finally reaches the hills 1,000 to 1,500 feet elevation and 25 to 40 miles inland. Rarely in the evening does it climb to the summit of these hills (2,000 to 3,000 feet elevation), though usually it rolls over them before morning. By 8 p. m. the grass is quite wet; all night long this bank lies over the the land. Soon after sunrise, generally about 8 a. m., the breeze springs up from the west, and by 10 a. m. the conditions are exactly the same as on the preceding day.

To one accustomed to the verdure of a well watered country, San Diego County ordinarily presents an arid appearance. Dependence is placed entirely upon irrigation, the natural precipitation being insufficient for any except the scanty vegetation of the desert. The rainfall of the higher elevations of the country is stored and used when necessary. During the eighteen months preceding March, 1898, in which period Mr. Hawks stated that "no rain of import had fallen," 15.74 inches, or 80 per cent of the normal precipitation had actually occurred. The natural state of the streams in San Diego County is that of dryness, the old joke about the rivers running upside down becomes a verity, as steadily flowing wells near the sunken river beds prove. The farmer accustomed to green looking hay would be shocked to see stock fattening on what appears to be the straw from "wheat fields burnt up." Instead of "cattle being driven out of the State" when pasturage fails on the lower coasts, they are simply moved 10 or 20 miles inland to higher elevations, where the rainfall is from four to five times greater than in the country bordering the coast. Fruit trees growing out of hard clods of sun-baked soil appear truly artificial, but no case of "fruit trees dying for lack of water" has yet come to my notice.

As to the sunshine and the implied high temperature, "the sun shining as it only can shine in the arid countries," I find that in point of fact, the mean of the highest temperatures for the three months was 62° in March, 65° in April, and 63° in May.

As to the strength of the wind, the article is again in error, for the records for the months under consideration, show an average velocity of 10 miles per hour from the sea and 5 from the land.

During this period there were two days with an hour or more of fog in March, six in April, and none in May: total eight. Possibly the memory of one night's fog, that of April 26, 1898, when it was as dense as a moist rain, depositing a trace in the rain gauge and causing the metal roofs of buildings to drip with moisture was indelibly fixed in the mind of the writer of the article: and was also responsible for the reference to fog on "3 days out of 5." There have been instances of deposits of water of 0.01 to 0.05 inch due to fog, but these occurrences are rare, not happening oftener than once

a year on an average. Since the establishment of this station in 1871, the mean number of foggy days dense enough to obscure objects a thousand feet distant has averaged nine for the entire year in San Diego.

During the late spring and early summer months the moisture-laden sea breeze carries over the land, not "tons upon tons of water," but of vapor that is visible as stratus cloud at from 500 to 1,000 feet altitude, and the cloud layer is so thick as to modify, and in some instances practically nullify insolation. At such times the sunlit bases of the mountains, 15 to 20 miles distant, beyond the cloud layers, can be readily seen. The temperature beyond the low cloud limit is frequently from 25° to 30° above the temperature at San Diego. That the thick stratus cloud presents quite an obstacle to the sun's rays is shown by the thermograph trace, which, during these not infrequent days, registers a horizontal line with but two or three degrees variation. This cloud is locally known as "high fog," which is but a popular definition of stratus cloud. The relative humidity near the earth is about normal during these times, ranging from 70 to 80 per cent.

Fog at the ground level is beneficial to orchards only in so far as it freshens the leaves and prevents evaporation from the soil. That it can never do much to supplement irrigation, nor the direct work of rainfall in watering the soil, is apparent when the infrequency of fog dense enough to deposit even 0.005 of an inch is considered. In addition to the normal rainfall of 10 inches, about a quarter of a million gallons of water for each acre is needed annually for citrus fruit. Allowing 80 trees to the acre, it is readily seen how insignificant the water condensed from a few foggy nights would be to a tree requiring more than 3,000 gallons as an annual water supply.

THE FLOOD OF JANUARY, 1880, AT BASSETERRE, ST. KITTS, W. I.

By WILLIAM H. ALEXANDER, Observer, Weather Bureau.

While strolling one morning along the streets of this city the writer's attention was attracted to a plain, massive monument in the cemetery on which he read the following inscription: "Sacred to the memory of those who perished in the flood in Basseterre, St. Christopher, on the 12th of January, 1880, and commemorative of that awful visitation, in which 231 persons lost their lives, of whom 101 are buried here."

Beyond the mere facts as to dates and results, as set forth in the above inscription, there seems to be no official record bearing on the event, and I have compiled the following lines by the help of the memory of eyewitnesses:

It seems there were no premonitory signs of the impending disaster further than toward sunset an unusual warmth was felt which continued up to 9 o'clock p. m., when "an intense cold set in," then a light shower of rain fell. The clouds gathered early in the evening, and very soon the city was enshrouded in intense darkness. "The darkness could almost be felt."

Occasional flashes of lightning accompanied by "deep rumbling thunder" now and then relieved the painful feeling. About 11 o'clock the rain began again, and eyewitnesses say it "looked like sheets of water pouring out of the clouds." Soon the place was flooded, and ere long the water began to creep into the houses, to the great consternation of the inmates, who, upon attempting to escape, found the streets like rivers, making egress not only unsafe but well-nigh impossible. Those who were so fortunate as to possess an "upstairs" availed themselves of the security afforded by a more elevated position, but unfortunately the great bulk of the population lived then, as now, in little one-story, one-roomed houses (if one can call them houses at all) built of light material and loosely put together, so that soon houses and all began to move seaward. The rain continued for about four hours, resulting as above indicated in the drowning of 231 persons certainly, and possibly more, beside the loss of property.

Many were buried beneath a layer of mud several feet deep that came down from the fields and mountains.

Of course, all gages and marks by which the amount of the precipitation could be measured or estimated, were either swept away completely or entirely submerged, and only individual opinions on this point can now be had. It is estimated that 23 inches fell within the four hours, and this augmented by the overflowing of the mountain streams, caused the great destruction of life and property. As in the days of ancient Babel so these people have attempted to fortify against any further disaster of this kind, not by erecting a tower but by encircling the city with a stone wall intended to check and divert the mountain streams into other channels.

[It is very much to be desired that the observers, located at stations whose climate is but little known to the citizens of the United States, should compile brief abstracts of all available records bearing on the climatology of such locations, especially matters affecting commerce, agriculture, and hygiene, or instructive from the point of view of the theoretical meteorologist. It requires much previous reading and study to prepare oneself for profitable scientific work when traveling into distant regions. Our observers at isolated stations, who are perhaps not confident of remaining long at any one place, can best begin their local studies by the collection of past records and by personal acquaintance with older local observers. Original manuscript records of work done in the tropical regions are very likely to be destroyed by mold and insects, even if not lost through neglect. The preservation of these original records is highly desirable, as they have never or rarely been published in full and contain the data for many important researches. Such manuscripts are doubtless worth asking for with a view to their future preservation in the fireproof vaults of the Weather Bureau. Many stations recently occupied by the Weather Bureau have also been previously occupied by other observers, and for the sake of the continuity of record, it is vitally important to institute a careful comparison between the old and the new instruments and the peculiarities of their respective localities.—ED.]

DERECHO, NOT TORNADO, OF MAY 16 IN OHIO.

By J. WARREN SMITH, Section Director.

At about noon on May 16 a wind squall entered northwestern Ohio and passed eastward across the State at the rate of about 50 miles an hour. It unroofed and damaged many buildings, leveled fences and a large number of oil derricks, and broke down orchard, shade, and forest trees.

The first damage noted in this State was in the western part of Gorham township in Fulton County, where a school house was blown down and several pupils injured. The following items from the teacher, Miss Fisher, will prove of interest:

The building in which I was teaching was a brick structure, put up in the cheapest possible manner, size about 28 by 34. The storm came up from the west and traveled in a southeasterly direction, the wind being from the southwest. It had the appearance of an ordinary heavy rain and wind storm. The storm had passed to the north when the wind turned to the northwest. It blew straight ahead as was conclusively proven by the fact that it did not pick up anything from the ground, not even disturbing a stick of wood on the wood pile. The wind seemed to dip and sweep the ground for 50 or 100 rods, then rise and pass over a mile or more, then fall again. I have no definite idea of the velocity of the wind, but it blew very hard and lasted one or two minutes; it was acompanied by a deluge of rain. The school building was a complete wreck, valued, together with its contents at about $1,000. There were 25 scholars within, of whom 5 were seriously and 8 slightly injured.